A PITFALL TRAP FOR REPETITIVE SAMPLING OF HYPOGEAN ARTHROPOD FAUNAS

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PITFALL TRAPS set at ground level are widely used in sampling surface arthropod faunas. Some arthropods, however, including several British beetles spend some of their lives beneath the surface of the soil. Some of these can be found in decaying vegetable material in the soil such as old seed potatoes, as was pointed out sometime ago by Wood (1886). Not all of them, however, can be found in this material and, anyway, their presence in such situations is not readily amenable to quantitative studies.

Recently, Thompson (1995) has described the capture in the London area of two specimens of the hypogean weevil *Raymondionymus marqueti* (Aubé) using a pitfall technique described by Kuschel (1991). This involved leaving an opened jar below ground for up to ten months. The method, however, requires a somewhat complicated procedure every time the trap is emptied and is not really suitable for repeated sampling. This note describes a type of pitfall trap designed to provide repetitive sampling of soil arthropods to a depth of at least 0.5 metres. If desired, the contents of the trap can be examined on a daily basis.

Construction of the trap

In brief, the trap is a hollow cylinder with mesh walls, set vertically into the soil. At the bottom of the cylinder is an open-topped, removable container (see photograph) which traps beetles and other arthropods which have made their way from the surrounding soil through the mesh walls and fallen down. The mesh allows them to gain access to the trap while preventing soil surrounding the trap from falling into the container.

The major items used in making the trap are:

1. A short piece of rigid plastic pipe, diameter 7-10cm, as used for domestic rain-water down pipes, obtainable from builders' suppliers and DIY stores.
2. A piece of strong plastic netting. The material used by the author was monofilament nylon net (cloth no. N2000\53) obtained (some time ago) from Begg, Cousland & Co. Ltd, 636 Springfield Road, Glasgow G40 3HS. This netting is woven from nylon thread diameter 0.75mm and has a mesh count of 3.6 per cm, giving an open area 53%.
3. A screw-cap, polythene bottle, with a capacity of 200-300 ml and with a diameter just less than the internal diameter of the rigid pipe, obtainable from camping or domestic hardware stores.

The cylindrical part of the trap is in two sections joined together – a long upper section made from the plastic netting and a short lower section comprising a piece of the rigid pipe cut to be 3-4cm longer than the height of

the bottle. The plastic netting is cut into a rectangular strip of length equal to the depth to which sampling is required and of width about 20% more than the circumference of the rigid pipe. The netting is rolled into a cylinder somewhat wider than the diameter of the bottle and wound round with two or three bands of self-adhesive PVC tape to maintain the cylindrical shape. The lower 2cm of the netting is fitted over the upper end of the rigid pipe (see photograph). The junction is sealed by a band of "Blue-tack" adhesive wound round the rim of the pipe before the netting is slipped over its end and the junction securely bound with self-adhesive tape.

The polythene bottle forms the container in which beetles and other arthropods are trapped. Openings are made in the shoulder of the bottle by making three vertical cuts with a hacksaw or sharp knife just clearing the neck of the bottle (see photograph) and three horizontal cuts just below the shoulder of the bottle. Care must be taken in making these cuts to leave three bands of polythene at least 1cm wide between the neck of the bottle and its walls so as not to weaken it unduly. In operation, the bottle must fit into the pipe in such a way that small creatures falling on to it cannot escape downwards between the outside of the bottle and the internal wall of the pipe. To achieve this, PVC tape is wound round the bottle in a band immediately below its shoulder until the bottle just slides into the pipe.

In the operation of the trap, the bottle is lowered into the device, or withdrawn from it, by means of a loading rod. This consists of a piece of wooden dowelling, 2-3cm in diameter, to one end of which the cap of the bottle is attached by a screw passing through a hole bored in the centre of the cap. The cap is attached with its outside next to the rod so that the bottle can temporarily be attached to the loading rod by applying the cap to the bottle and turning the rod clockwise. Before the trap is set into the soil, the bottle attached to the rod is inserted into the trap and a mark made on the rod corresponding to top of the mesh cylinder. This serves to indicate how far the bottle must be inserted when the trap is in operation in the ground.

Operation of the trap

To set up the trap, a vertical hole, wide enough to take the trap, is dug with a hand trowel in the selected spot. When the chosen depth has been reached (the upper edge of the netting should be just below the level of the surrounding soil), the cylinder is inserted into the hole and the soil packed tightly round the outside of the rigid pipe with a piece of wood such as the free end of the loading rod. The space between the outside of the netting cylinder and the sides of the hole is then carefully filled up with some of the soil removed in making the hole, packing the soil as far as possible to its normal consistency. The bottle with preservative is then attached to the loading rod and lowered into the device. When it is in position within the rigid tube, the loading rod is turned anti-clockwise until the cap is free and the loading rod withdrawn. A jam-jar lid is then placed over the top of the netting cylinder and a paving stone slab placed over the whole for protection.

The photograph shows the region of the trap at the junction of the netting and the rigid pipe. A piece of the netting has been cut away to show how the collecting bottle sits neatly in the rigid pipe at the bottom of the trap.

To examine the contents of the trap, the loading rod is inserted after the cover has been removed. The rod is twisted clockwise to attach the cap to the bottle and the latter then withdrawn. Small amounts of soil falling down during removal or replacement of the bottle are accommodated at the bottom of the rigid pipe which is a few centimetres longer than the height of the bottle.

If the trap is to remain in place for more than a few days, the bottle must contain some preservative. Thompson (1995) used a mixture of sherry and vinegar which probably acted as an attractant as well as a preservative. Clearly there are many other possibilities to be investigated.

Results and discussion

Capture of the following beetles trapped over a few weeks by two prototype traps set in the author's garden and loaded with a sherry-vinegar mixture illustrates the sampling potential of the device:

Kissister minimus (Aubé) – 1 ex.
Ptenidium laevigatum Erichson – 7 exx.
Parabathyscia wollastoni (Janson, E.W.) – 1 ex.
Langelandia anophthalma (Aubé) – 10 exx.
Raymondionymus marqueti (Aubé) – 3 exx.

The ability of the trap to capture small creatures is shown by the presence in the catch of *P. laevigatum,* a minute beetle about 0.4mm high by about 0.5mm wide.

It will be obvious that the trap as described will be open to soil inhabitants living at all levels from the soil surface down to the lower edge of the netting. If it is desired to exclude creatures living above a certain level, the device can easily be modified by winding a spiral of PVC insulating tape around the netting from the top down to the critical level.

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References

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